Appendix VIII

Construction Materials Test Results

TETRA TECH

605 N. Warehouse Road
Casper, WY 82601

PH: 307.234.2126
Fax: 307.266.5143

TECHNICAL REPORT

REPORT TO: Ms. Cindi Martinez
Wyoming Department of Environmental Quality
Solid and Hazardous Waste Division
122 West 25th Street
Herschler Building – 4th Floor West
Cheyenne, Wyoming 82002

DATE: September 18, 2012
JOB NO.: 114-510538
SHEET 1 **OF** 9

REPORT OF: Wolcott Street Acid Sludge Remediation Project,
Former Lobell Refinery Orphan Site 57.004
Casper, Wyoming

PROJECT REPORT

DAILY REPORT NO. 1 – Dallas Jaehn, Sr. Engineering Technician - 2.0 hours
September 10, 2012

3:30 pm to 5:30 pm - Loaded testing equipment and traveled to the Wolcott Street Acid Sludge Remediation Project site. Met with Mr. Matt McCann with Tetra Tech and contractor personnel and discussed the placement of the imported fill material in the excavation. Mr. McCann stated approximately 1 ft of the fill had been placed. In-place density Test Nos. 1 through 3 were performed in the fill placement at the locations and elevations indicated on the attached summary sheet. All personnel were advised the test results failed to meet the project requirements. The subcontractor, Coleman Construction, stated the east and west portions were not completed where the tests were performed. Mr. Rick Hammond with FMS stated he was not informed the areas were not ready for testing. The contractor requested in-place density testing in the central portion of the fill placement. In-place density Test Nos. 4 through 6 were performed and all personnel were advised the test results met the project requirements. The subcontractor requested tests at a deeper elevation on the west and east portions of the excavation in the failed fill areas. In-place density Test Nos. 7 through 9 were performed and failed to meet the project requirements. The contractor was advised the entire failed areas needed to be reworked with moisture added and blended with the fill. Further testing services were scheduled at 9:30 am on 9/11/12. Mr. McCann was advised to observe the reworking of the fill placement. Reworking of the fill will void Test Nos. 1 through 3 and 7 through 10. Ms. Dorothy Hall with Tetra Tech was advised of the construction activities and test results which are presented on the attached summary sheets. Laboratory test results for the previously submitted fill material are presented on Figures 1 and 1A, attached. Returned to the office and prepared daily report.

DAILY REPORT NO. 2 – Dallas Jaehn, Sr. Engineering Technician - 4.0 hours
September 11, 2012

10:15 am to 12:15 pm - Loaded testing equipment and traveled to the Wolcott Street Acid Sludge Remediation Project site. Met with Mr. Matt McCann with Tetra Tech and Mr. Rick Hammond with FMS and discussed the placement of fill in the excavation. Observed the subcontractor, Coleman Construction, was completing the compaction effort on the placed fill lift. In-place density Test Nos. 11 through 14 were performed in the fill placement at the locations and elevations indicated on the attached summary sheet. Mr.

McCann and Mr. Hammond were advised the test results met the project requirements. Further testing services were scheduled for 1:30 pm. Left the project site.

1:30 pm to 3:30 pm – Returned to the project site. Met with Mr. McCann and Mr. Hammond and discussed the continued placement of fill material. In-place density Test Nos. 15 through 18 were performed in the fill placement at the locations and elevations indicated on the attached summary sheet. All personnel were advised the test results met the project requirements. Ms. Dorothy Hall with Tetra Tech requested a sample of the 100% recycled concrete Grading "W" base course be obtained at Wayne Coleman Construction yard. Traveled to the yard and obtained a sample from the loader provided template from the stockpile for gradation analysis. Returned to the office and prepared daily report. The gradation test results are presented on Table I, attached.

DAILY REPORT NO. 3 – Dallas Jaehn, Sr. Engineering Technician – 2.5 hours
September 12, 2012

11:30 am to 12:30 pm - Loaded testing equipment and traveled to the Wolcott Street Acid Sludge Remediation Project site. Met with Mr. Matt McCann with Tetra Tech and Mr. Rick Hammond with FMS and discussed the placement of fill material in the excavation. Mr. Hammond stated Coleman Construction personnel were not on-site and the fill lift compaction effort was not known at this time. Mr. McCann stated Tetra Tech personnel will be contacted for testing services when the status of the fill placement was determined. Left the site.

1:30 pm to 3:00 pm – Returned to the project site at Mr. McCann's request. Met with Mr. Hammond who stated the fill placement was ready for density testing. In-place density Test Nos. 19 through 23 were performed at the locations and elevations indicated on the attached summary sheet. Mr. McCann and Mr. Hammond were advised the test results met the project requirements. Returned to the office and prepared daily report. Met with Ms. Dorothy Hall with Tetra Tech who stated the 100% recycled concrete Grading "W" base course was approved by the City of Casper's Engineer and additional laboratory testing would proceed on the base sample. The laboratory test results are presented on Figures 2 and 2A, attached.

DAILY REPORT NO. 4 – Dallas Jaehn, Sr. Engineering Technician – 2.5 hours
September 13, 2012

8:00 am to 9:00 am - Loaded testing equipment and traveled to the Wolcott Street Acid Sludge Remediation Project site. Met with Mr. Matt McCann with Tetra Tech and Mr. Rick Hammond with FMS and discussed the completion of the excavation fill placement to final subgrade elevation. In-place density Test No. 24 was performed in the fill placement and all personnel were advised the test results met the project requirements. Traveled to the office.

11:30 am to 1:00 pm – Returned to the project site. Met with Mr. McCann ad Mr. Hammond and discussed the placement of the 100$ recycled concrete Grading "W" base course in the northeast corner of the excavation. In-place density Test No. 25 was performed in the base course and all personnel were advised the test results met the project requirements. Returned to the office and prepared daily report.

DAILY REPORT NO. 5 – Troy Lein, Engineering Technician – 3.0 hours
September 14, 2012

12:30 pm to 3:30 pm – Loaded equipment and traveled to the Wolcott Street Acid Sludge Remediation Project site. Met with Mr. Rick Hammond with FMS and discussed the placement of approximately 10 cubic

yards of concrete on the west side of Wolcott for the curb and gutter. Obtained a sample of concrete, supplied by Knife River, from the first truck load for determination of slump, total air content, unit weight and temperature. Compressive strength Cylinder Nos. 1 through 4 were cast and placed in a cure container with water. The slump was 4½ inches; the project specifications required a maximum of 4 inches. All other test results met the City of Casper specifications. Test results are presented on the attached concrete summary sheet. Returned to the office and prepared daily report.

DAILY REPORT NO. 6 – Dallas Jaehn, Sr. Engineering Technician – 3.5 hours
September 17, 2012

7:00 am to 8:00 am - Loaded testing equipment and traveled to the Wolcott Street Acid Sludge Remediation Project site. Met with Mr. Matt McCann with Tetra Tech and Mr. Rick Hammond with FMS, who stated concrete placement was postponed due to the current rainfall. Left the project site

1:15 pm to 3:45 pm – Returned to the project site. Observed the concrete supplier, Knife River, arrived late on-site. Was advised concrete would be placed for the remaining curb walk - south section and small north section. A sample of the concrete was obtained and tests consisting of slump, total air content, unit weight and temperature were performed. Concrete test Cylinder Nos. 5 through 8 were cast and placed in a cure container with water. Approximately a total of 10 cubic yards of concrete were placed. Mr. Hammond and Mr. McCann were advised of the test results which are presented on the attached concrete summary sheet.

Mr. McCann stated the recycled concrete Grading "W" base course placement for the roadway was ready for density testing. In-place density Test Nos. 26 through 29 were performed at the locations and elevations indicated on the attached summary sheet. Mr. McCann and Mr. Hammond were advised the test results met the project requirements. Obtained previously cast test cylinders, returned to the office and prepared daily report.

DAILY REPORT NO. 7 – Dallas Jaehn, Sr. Engineering Technician – 1.0 hours
September 18, 2012

8:00 am to 9:00 am - Loaded testing equipment and traveled to the Wolcott Street Acid Sludge Remediation Project site. Obtained previously cast test cylinders, returned to the office and prepared daily report.

Reviewed By: _____
Mark Peloquin
Construction Services Manager

TETRA TECH

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Casper, WY 82601

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TECHNICAL REPORT

REPORT TO: Ms. Cindi Martinez
Wyoming Department of Environmental Quality
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122 West 25th Street
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DATE: September 18, 2012
JOB NO.: 114-510538
SHEET 4 **OF** 9

REPORT OF: Wolcott Street Acid Sludge Remediation Project,
Former Lobell Refinery Orphan Site 57.004
Casper, Wyoming

SAMPLE IDENTIFICATION

Attached are the results of field density tests performed on the above-referenced project on the dates and at the locations shown. Unless otherwise noted, our personnel utilized the nuclear densometer method of testing in accordance with ASTM D6938.

Contractor: Fuel Management Solutions / Coleman Construction

Test Locations Were Selected by: Tetra Tech Personnel

Minimum Required In-Place Density: 95% of Maximum Required
±2% of Optimum Moisture Content

Maximum Density As Determined By: ASTM D698

Reviewed by: Mark Peloquin

TEST RESULTS:

Test Date	Test Number	Moisture Content (%)	Dry Density (p.c.f.)	Minimum Dry Density (p.c.f.)	Maximum Dry Density (p.c.f.)	Percent of Relative Obtained	Soil Type
		----------FIELD--------		------LABORATORY------			
9/10/12	1	5.4	107.2	10.3	115.8	(93)	Crushed Recycled Concrete
Location:	20' north and 10' west of SE corner of excavation: 2.5' below top of curb **(Test was Voided)**						
9/10/12	2	7.0	105.7	10.3	115.8	(91)	Crushed Recycled Concrete
Location:	45' north and 35' west of SE corner of excavation; 3' below top of curb **(Test was Voided)**						
9/10/12	3	7.3	106.3	10.3	115.8	(92)	Crushed Recycled Concrete
Location:	110' north and 38' west of SE corner of excavation; 3' below top of curb **(Test was Voided)**						
9/10/12	4	10.6	111.1	10.3	115.8	96	Crushed Recycled Concrete
Location:	100' north and 25' west of SE corner of excavation; 2.3' below top of curb						
9/10/12	5	10.4	110.5	10.3	115.8	95	Crushed Recycled Concrete
Location:	115' north and 23' west of SE corner of excavation; 2.5' below top of curb						
9/10/12	6	10.3	110.5	10.3	115.8	95	Crushed Recycled Concrete
Location:	6' north and 22' west of SE corner of excavation; 2' below top of curb						
9/10/12	7	6.1	105.8	10.3	115.8	(91)	Crushed Recycled Concrete
Location:	120' north and 8' west of SE corner of excavation: 2.7' below top of curb **(Test was Voided)**						
9/10/12	8	6.3	106.5	10.3	115.8	(92)	Crushed Recycled Concrete
Location:	27' north and 8' west of SE corner of excavation; 2.7' below top of curb **(Test was Voided)**						
9/10/12	9	7.0	107.0	10.3	115.8	(92)	Crushed Recycled Concrete
Location:	20' north and 39' west of SE corner of excavation: 3.2' below top of curb **(Test was Voided)**						
9/10/12	10	6.5	107.3	10.3	115.8	(93)	Crushed Recycled Concrete
Location:	85' north and 36' west of SE corner of excavation: 3' below top of curb **(Test was Voided)**						

( ) Failed to meet project requirement.

TEST RESULTS: ----------FIELD-------- ------LABORATORY------

Test Date	Test Number	Moisture Content (%)	Dry Density (p.c.f.)	Minimum Dry Density (p.c.f.)	Maximum Dry Density (p.c.f.)	Percent of Relative Obtained	Soil Type
9/11/12	11	10.4	113.5	10.3	115.8	98	Crushed Recycled Concrete
Location:	130' north and 36' west of SE corner of excavation; 2.5' below top of curb						
9/11/12	12	9.2	112.5	10.3	115.8	97	Crushed Recycled Concrete
Location:	30' north and 34' west of SE corner of excavation: 2.2' below top of curb						
9/11/12	13	8.3	113.9	10.3	115.8	98	Crushed Recycled Concrete
Location:	40' north and 8' west of SE corner of excavation; 2.5' below top of curb						
9/11/12	14	11.7	112.0	10.3	115.8	96	Crushed Recycled Concrete
Location:	125' north and 10' west of SE corner of excavation; 2.5' below top of curb						
9/11/12	15	12.2	114.5	10.3	115.8	99	Crushed Recycled Concrete
Location:	60' south and 11' west of NE corner of excavation; 1' below top of curb						
9/11/12	16	12.3	114.9	10.3	115.8	99	Crushed Recycled Concrete
Location:	80' north and 9' west of SE corner of excavation; 1.8' below top of curb						
9/11/12	17	11.8	115.8	10.3	115.8	100	Crushed Recycled Concrete
Location:	10' north and 32' west of SE corner of excavation; 1.2' below top of curb						
9/11/12	18	12.0	113.6	10.3	115.8	98	Crushed Recycled Concrete
Location:	45' west and 125' north of SE corner of excavation; 2.5' below top of curb						
9/12/12	19	8.4	113.7	10.3	115.8	98	Crushed Recycled Concrete
Location:	50' south and 8' west of NE corner of excavation; 1' below top of curb						
9/12/12	20	9.4	113.3	10.3	115.8	98	Crushed Recycled Concrete
Location:	60' north and 15' west of SE corner of excavation: 1' below top of curb						

TEST RESULTS: ----------FIELD-------- ------LABORATORY------

Test Date	Test Number	Moisture Content (%)	Dry Density (p.c.f.)	Minimum Dry Density (p.c.f.)	Maximum Dry Density (p.c.f.)	Percent of Relative Obtained	Soil Type
9/12/12	21	12.3	112.3	10.3	115.8	97	Crushed Recycled Concrete
Location:	25' west and 9' north of SE corner of excavation: 1' below top of curb						
9/12/12	22	9.1	113.6	10.3	115.8	98	Crushed Recycled Concrete
Location:	60' north and 40' west of SE corner of excavation: 1' below top of curb						
9/12/12	23	10.2	112.7	10.3	115.8	97	Crushed Recycled Concrete
Location:	20' south and 15' east of NW corner of excavation; 1.5' below top of curb						
9/13/12	24	8.0	113.8	10.3	115.8	98	Crushed Recycled Concrete
Location:	10' east and 6' south of NW corner of excavation; 2' below top of asphalt						
9/13/12	25	12.9	109.4	12.2	115.0	95	100% Recycled Concrete Grading W Base Course
Location:	5' south and 5' west of NE corner of excavation; 1' below top of asphalt						
9/17/12	26	10.3	112.9	12.2	115.0	98	100% Recycled Concrete Grading W Base Course
Location:	18' north and 15' east of SW corner of excavation; at final grade						
9/17/12	27	11.9	112.7	12.2	115.0	98	100% Recycled Concrete Grading W Base Course
Location:	55' north and 12' west of SE corner of excavation; at final grade						
9/17/12	28	10.4	109.8	12.2	115.0	95	100% Recycled Concrete Grading W Base Course
Location:	65' south and 10' west of NW corner of excavation; at final grade						
9/17/12	29	10.3	109.7	12.2	115.0	95	100% Recycled Concrete Grading W Base Course
Location:	25' south and 15' west of NE corner of excavation; at final grade						

CONCRETE TESTING SUMMARY

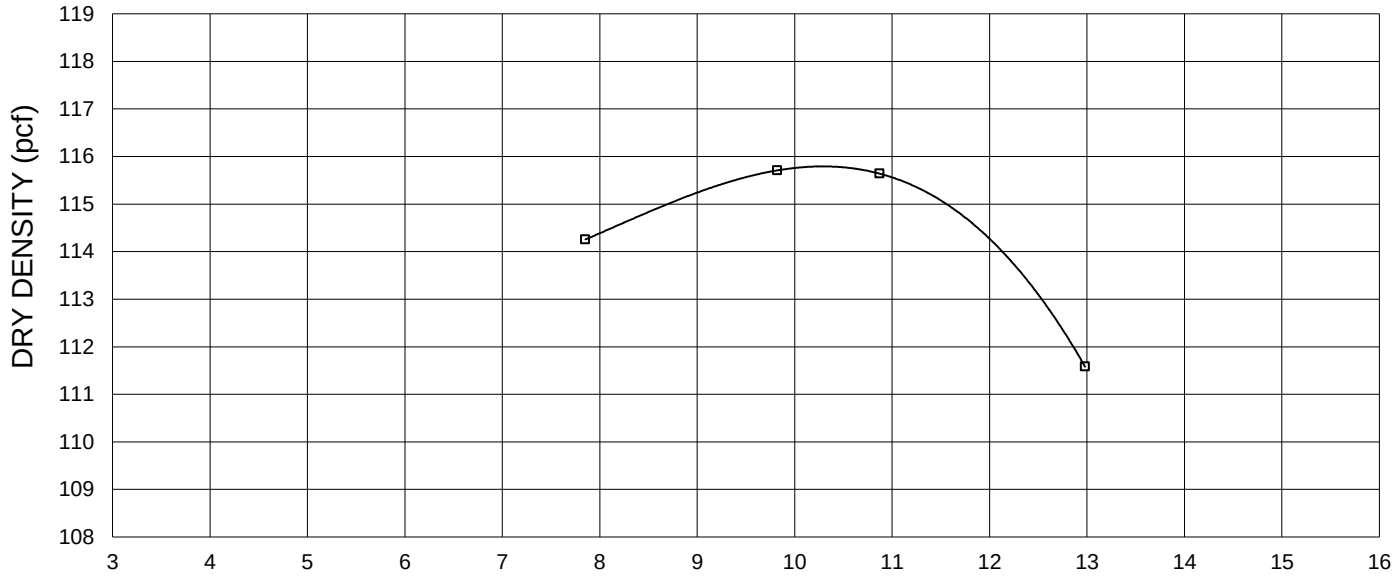
Date of Pour	Location of Pour	Ticket Number	Truck Number	Batch Out Time	Time of Tests	Slump (in.)	Air (%)	Unit Weight (pcf)	Air Temp. ◦F	Concrete Temp. ◦F	Remarks
9/14/12	Curb and Gutter 110' north and 10' east of NW Corner of Collins and Wolcott Streets	223486	6296	1:51 pm	2:30 pm	4½	5.8	142.8	79	78	10 / 10 cubic yards placed Cast Cylinder Nos. 1 - 4
9/17/12	Curbwalk, Large South Section and Small North Section	223509	4518	1:51 pm	2:35 pm	4¼	5.1	147.2	80	72	10 / 10 cubic yards placed Cast Cylinder Nos. 5 -8

TETRA TECH

Table I
Laboratory Test Results
Wolcott Street Acid Sludge Remediation Project
Former Lobell Refinery Orphan Site 57.004
Casper, Wyoming

Sieve Size	100% Recycled Concrete Grading "W" Base Course Produced by Wayne Coleman Construction (Percent Passing)	Grading "W" Base Course Specifications (Percent Passing)
1½"	100	100
1"	99	90-100
3/4"	91	
1/2"	80	60-85
3/8"	72	
No. 4	57	
No. 8	50	45-65
No. 16	42	33-53
No. 30	31	
No. 50	21	
No. 100	13	
No. 200	8.7	3-12

MOISTURE - DENSITY CURVE



ASTM D698, METHOD A

MAXIMUM DRY DENSITY: 115.8 pcf OPTIMUM MOISTURE CONTENT: 10.3%

PARTICLE SIZE	FRACTION OF SAMPLE (%)
GRAVEL	16
SAND	78
FINES (SILT AND CLAY)	6

ATTERBERG LIMITS

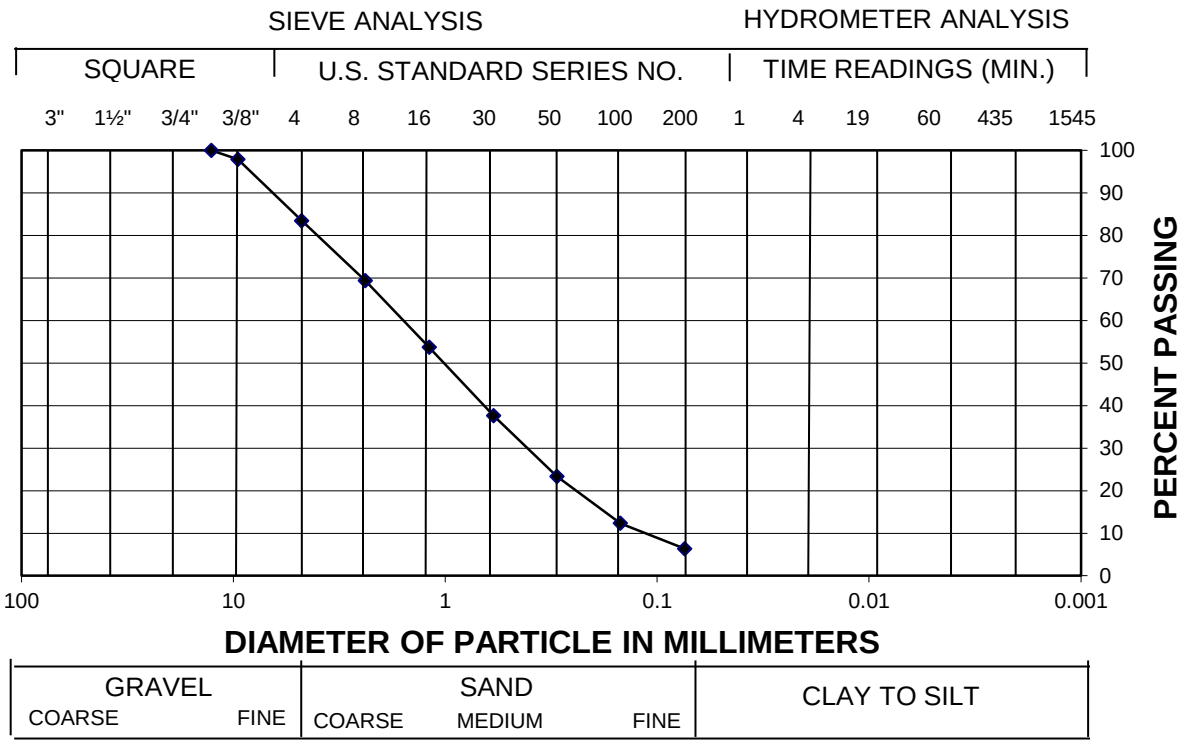
LIQUID LIMIT	NV
PLASTICITY INDEX	NP

SAMPLE IDENTIFICATION:
Imported Fill from Wayne Coleman Construction
Crushed Recycled Concrete

EQUIVALENT SOIL CLASSIFICATION:
Sand with Silt and Gravel (SP-SM)

WOLCOTT STREET ACID SLUDGE REMEDIATION PROJECT
FORMER LOBELL REFINERY ORPHAN SITE 57.004
CASPER, WYOMING

510538	TETRA TECH	MOISTURE-DENSITY RELATIONSHIP	Fig. 1



SIEVE SIZE	PERCENT PASSING
1/2"	100
3/8"	98
#4	83
#8	69
#16	54
#30	38
#50	23
#100	12
#200	6

ATTERBERG LIMITS:

Liquid Limit	NV
Plasticity Index	NP

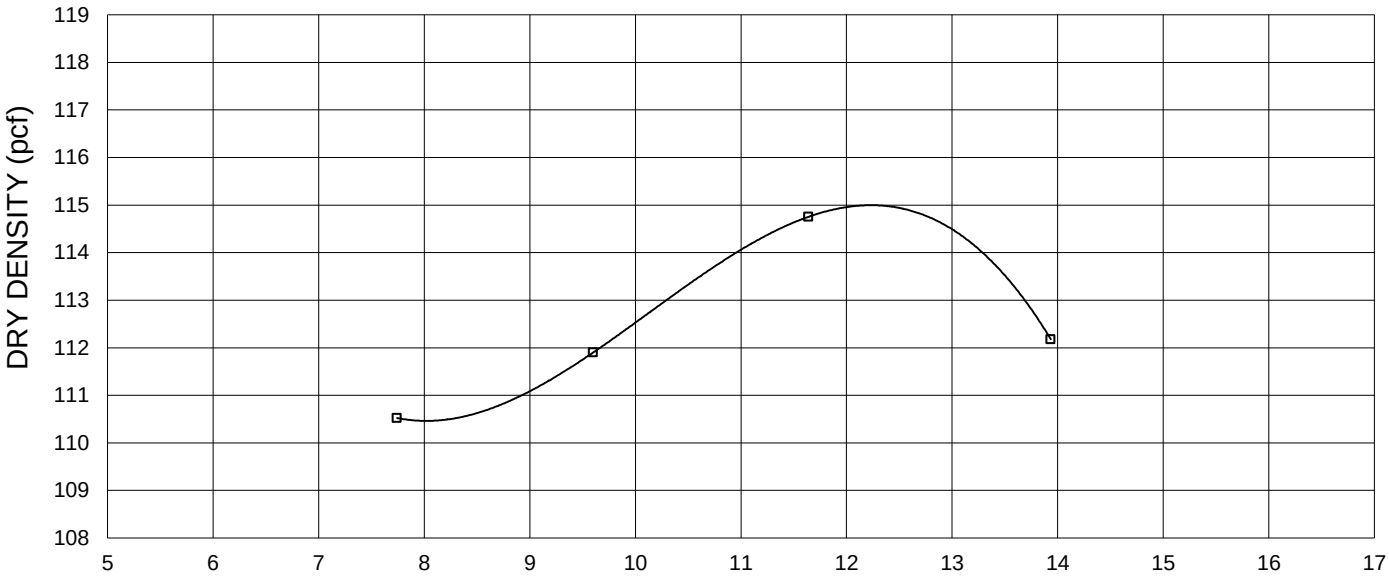
SAMPLE IDENTIFICATION:
Imported Fill from Wayne Coleman Construction
Crushed Recycled Concrete

EQUIVALENT SOIL CLASSIFICATION:
Sand with Silt and Gravel (SP-SM)

WOLCOTT STREET ACID SLUDGE REMEDIATION PROJECT
FORMER LOBELL REFINERY ORPHAN SITE 57.004
CASPER, WYOMING

510538	TETRA TECH	GRADATION ANALYSIS	Fig. 1A

MOISTURE - DENSITY CURVE



ASTM D698, METHOD C

MAXIMUM DRY DENSITY: 115.0 pcf OPTIMUM MOISTURE CONTENT: 12.2%

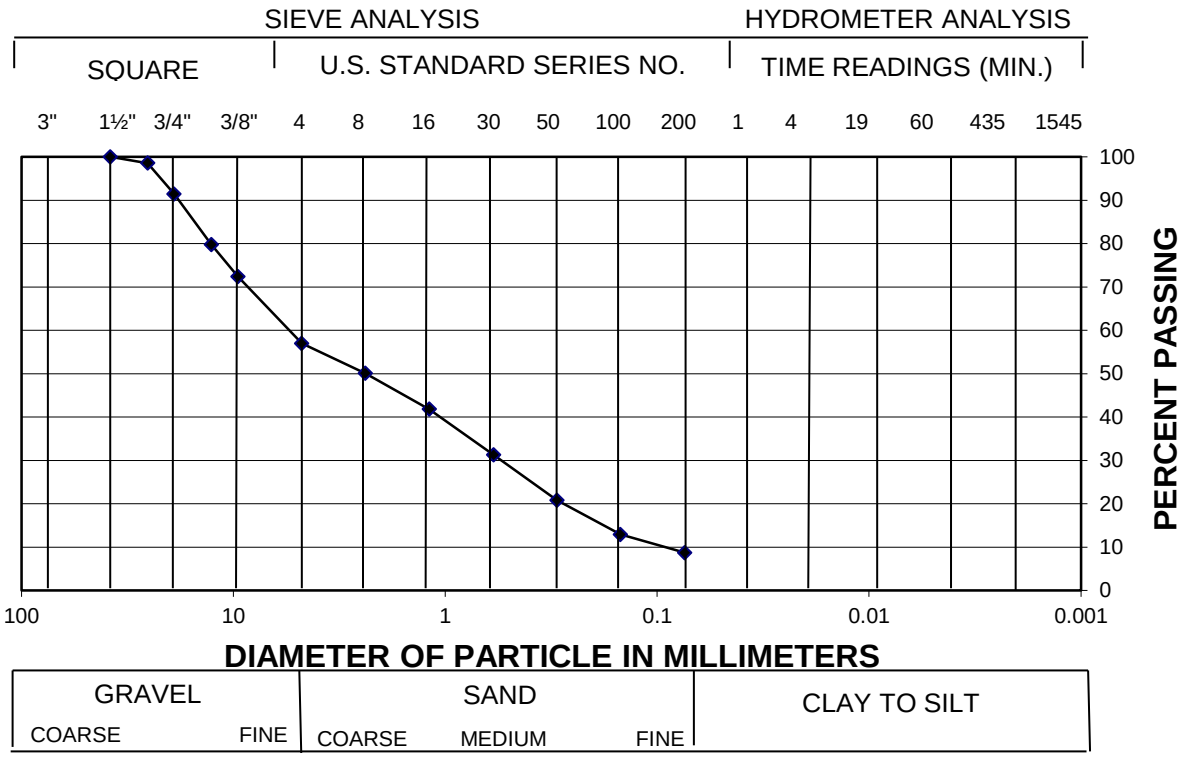
PARTICLE SIZE	FRACTION OF SAMPLE (%)
GRAVEL	43
SAND	48
FINES (SILT AND CLAY)	9

SAMPLE IDENTIFICATION:
Obtained from Wayne Coleman Construction Yard Stockpile

SOIL CLASSIFICATION:
100% Recycled Concrete Grading "W" Base Course

WOLCOTT STREET ACID SLUDGE REMEDIATION PROJECT
FORMER LOBELL REFINERY ORPHAN SITE 57.004
CASPER, WYOMNG

510538	TETRA TECH	MOISTURE-DENSITY RELATIONSHIP	Fig. 2



SIEVE SIZE	PERCENT PASSING	GRADING W BASE SPECIFICATIONS
11/2"	100	100
1"	99	90-100
3/4"	91	
1/2"	80	60-85
3/8"	72	
#4	57	45-65
#8	50	33-53
#16	42	
#30	31	
#50	21	
#100	13	
#200	8.7	3-12

SAMPLE IDENTIFICATION:
Obtained from Wayne Coleman Yard Stockpile

SOIL CLASSIFICATION:
100% Recycled Concrete Grading W Base Course

WOLCOTT STREET ACID SLUDGE REMEDIATION PROJECT
FORMER LOBELL REFINERY ORPHAN SITE 57.004
CASPER, WYOMING

510538	TETRA TECH	GRADATION ANALYSIS	Fig. 2A

TETRA TECH

605 N. Warehouse Road
Casper, WY 82601

PH: 307.234-2126
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REPORT OF CONCRETE TEST DATA
ASTM C39

TO: Ms. Cindi Martinez
Wyoming Department of Environmental Quality
Solid and Hazardous Waste Division
122 West 25th Street
Herschler Building - 4th Floor West
Cheyenne, Wyoming 82002

JOB NO.: 114-510538

PROJECT: Wolcott Street Acid Sludge Remediation Project
CONTRACTOR: Ramshorn Construction

LOCATION: Curb and Gutter, 110' North and 10' East of NW Corner of Collins and Wolcott

CYLINDER ID	DATE CAST	AGE (days)	DATE TESTED	TOTAL LOAD (lbs.)	AREA (sq. in.)	DIA. (in.)	TYPE (1) FRAC.	COMPRESSIVE STRENGTH, (psi)
1	9/14/12	7	9/21/12	35,851	12.60	4.005	5	2850
2	9/14/12	28	10/12/12	47,628	12.59	4.003	5	3780
3	9/14/12	28	10/12/12	48,278	12.60	4.006	5	3830
4	9/14/12	28	10/12/12	49,508	12.57	4.001	5	3940

ASTM methods: (2) C 138; (3) C 231; (4) C 143; (5) C 1064
Some information on this test report may be provided by others.

MATERIALS AND MIX DATA

BATCH TIME: 1:51 pm
SACKS C.Y.:
ADMIXTURES:

REQUIRED PSI: **7 Day**
CU. YDS. REP.: 10 / 10
CEMENT BRAND:

REQUIRED PSI: 4000 **28 Day**
CONC. SUPPLIER: Knife River
METHOD OF MIX: Truck

FIELD TEST DATA

REPORTED:
DATE REC'D: 9/17/12
TIME CAST: 2:30 pm
TRUCK NO.: 6296

(2) **UNIT WEIGHT (pcf):** 142.8
(3) **AIR CONTENT (%):** 5.8
(4) **SLUMP (in.):** 4½
TICKET NO.: 223486

CAST BY: T. Lein (Tetra Tech)
AIR TEMP.: 79°F
(5) **CONC. TEMP.:** 73°F
CURING: 3 days field cured; remainder moist cured

REMARKS:

(1) **TYPE OF FRACTURE:** **Cone (1)** **Cone & Split (2)** **Columnar (3)** **Shear (4)** **One Side (5)** **Two Sides (6)**

NOTED DEFECTS:

DISTRIBUTION:

REVIEWED BY: Mark Peloquin
Construction Services Manager

TETRA TECH

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REPORT OF CONCRETE TEST DATA
ASTM C39

TO: Ms. Cindi Martinez
Wyoming Department of Environmental Quality
Solid and Hazardous Waste Division
122 West 25th Street
Herschler Building - 4th Floor West
Cheyenne, Wyoming 82002

JOB NO.: 114-510538

PROJECT: Wolcott Street Acid Sludge Remediation Project
CONTRACTOR: Ramshorn Construction

LOCATION: Curbwalk - Large South Section and Small North Section

CYLINDER ID	DATE CAST	AGE (days)	DATE TESTED	TOTAL LOAD (lbs.)	AREA (sq. in.)	DIA. (in.)	TYPE (1) FRAC.	COMPRESSIVE STRENGTH, (psi)
5	9/17/12	7	9/24/12	57,524	12.60	4.005	5	4570
6	9/17/12	28	10/15/12	73,032	12.60	4.006	3	5800
7	9/17/12	28	10/15/12	72,544	12.63	4.010	5	5740
8	9/17/12	28	10/15/12	71,441	12.57	4.000	4	5680

ASTM methods: (2) C 138; (3) C 231; (4) C 143; (5) C 1064
Some information on this test report may be provided by others.

MATERIALS AND MIX DATA

BATCH TIME: 1:51 pm
SACKS C.Y.:
ADMIXTURES:

REQUIRED PSI: **7 Day**
CU. YDS. REP.: 10
CEMENT BRAND:

REQUIRED PSI: 4000 **28 Day**
CONC. SUPPLIER: Knife River
METHOD OF MIX: Truck

FIELD TEST DATA

REPORTED:
DATE REC'D: 9/18/12
TIME CAST: 2:35 pm
TRUCK NO.: 4518

(2) **UNIT WEIGHT (pcf):** 147.2
(3) **AIR CONTENT (%):** 5.1
(4) **SLUMP (in.):** 4¼
TICKET NO.: 223509

CAST BY: D. Jaehn (Tetra Tech)
AIR TEMP.: 80°F
(5) **CONC. TEMP.:** 72°F
CURING: 1 day field cured; remainder moist cured

REMARKS:

(1) **TYPE OF FRACTURE:** **Cone (1)** **Cone & Split (2)** **Columnar (3)** **Shear (4)** **One Side (5)** **Two Sides (6)**

NOTED DEFECTS:

DISTRIBUTION:

REVIEWED BY: Mark Peloquin
Construction Services Manager